Uncle Sam's Wizard of Metallurgy Refuses Fabulous Wealth

With Money Pouring In Upon Him Dr. Cottrell Diverts Golden Stream to Benefit Struggling Scientists

By ALBERT WHITING FOX.

HERE is a man working for a modest government compensation who to-morrow could command a salary waich would make the earnings of a popular movie star look readiness to give his services exclusively to one concern and have the directors of American steel companies. copper companies, zinc companies, &c. hurrying here ready to outbid each

other in big round, substantial figures. Frederick G. Cottrell, chief metallurgist of the Bureau of Mines, is the man in question. The story of his career, the results he has achieved and is achieving and the rapidly accumulating benefits which the nation is getting from his work form a striking romance of science.

A little more than ten years ago Dr. Cottrell was a poorly paid, struggling assistant professor of chemistry in the University of California. Now he has saved big plants in the country literally millions of dollars, has found a means of giving the United States a potash supply independent of Germany, has been responsible largely for by passing the gases, carrying the the development of the non-inflammable gas helium of inestimable military tween two systems of electrodes, one and commercial value, and stands out as such an undisputed leader in his tive electrical charge, while the other line that he was awarded the Perkin medal for 1919 by the Society of Chem-lcal Industry "in recognition of his most original and valuable work in high voltage electricity, consisting of a pplied chemistry."

high voltage transformer for in-

Diverts Golden Stream.

Only in the matter of financial recompense has Dr. Cottrell remained backward. He has consistently refused all offers to make a fortune out of his work, and when money began to pour in upon him in spite of himself he promptly got his friends together, formed what is known as the "research corporation," turned the financial stream into the corporation with the provision that the funds were to be used to assist struggling scientists whose hardships he already knew. An ironclad agreement has been made that corporation and not to Mr. Cottrell

No one would imagine from his smoke nuisance if given a chance. He manner or appearance that Dr. Cot- obtained the personal and financial trell had already risen to the top rank among the scientists of the world. There is nothing about him to suggest the popular conception of the great Heller, both alumni of the university. the popular conception of the great scientist. He looks like the typical wide awake American business man wide awake American business man could attempt to get some of the of 40, who has no fads and believes in smelting companies interested, but his the free and easy unconventional way efforts along this line were either not of meeting men with whom he comes

After luncheon with him at the club one might say that his particular interest was in how to care properly for that his presence was known by the an automobile or in billiards. At pres- men running the smelters. Strangely ent Dr. Cottrell is making a flying trip enough this "smoke bug" was to play to Europe in connection with helium an all important part in the develop

The first big contribution of Dr. Cotsolids, or, in popular terms, the climitrouble with the orange growers in the no relief in sight. The directors were him interesting and full of suggestable and rescue of smoke and rescu smoke as a nuisance, the process orange growers had taken the matter showed that the so-called smoke dust into the courts and were spending or the directors said, "Bring him to us." was good, but Dr. Cottrell told them had been discovered.

A recent statement issued by the precipitated at big plants was worth in hundreds of thousands of dollars in ome cases more than the product be- pressing and winning their cases. ing manufactured.

It was in 1906 while he was working as assistant professor of chemis-try at the University of California that the idea first came to Dr. Cottrell. California at that time was much an-noyed over fumes from smelters. There were examples of it close to the like pin money. He could announce his university. The fumes were admittedly newssary to the running of the smelters, but were a nuisance to every one within their radius. There was continued talk about it, but no one suggested a possible remedy, excepting

Springs His Surprise.

Dr. Cottrell said little, but it was noticed that he began spending all his spare time in the laboratory. He worked whenever he got a chance during the day and far into the night. Finally he surprised his friends at the university by telling them that he had discovered an "electrical precipitation the smoke.

In a general way his idea was to remove the suspended particles from the gases by the aid of electrical discharges. His process was to operate suspended, finely divided particles, beof which was made to carry a negacarried a positive charge.

The electrodes were to be charged by being connected with a source of creasing the electric potential up to a working voltage of from 20,000 to 100,000 volts. A rectifier for changing alternating current into direct current and a switchboard were to provide the necessary control equipment. Dr. Cot-trell figured that the suspended particles while passing between the elec-trodes would become electrically charged and would be driven into pipes by the forces of the electric field. The professors at the university believed in Cottrell and were interested

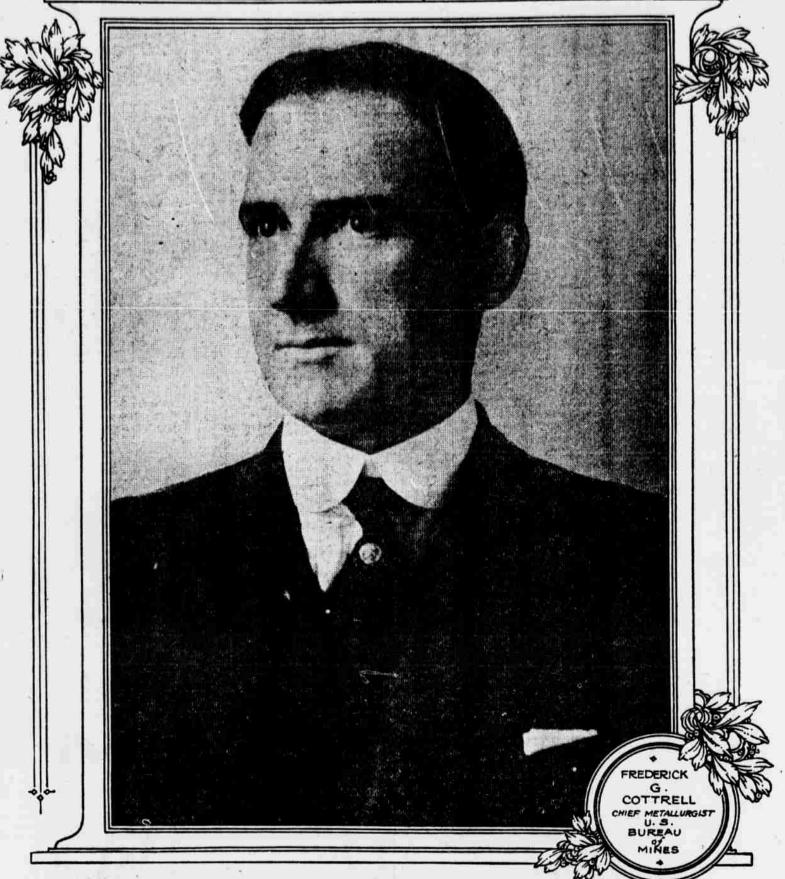
in his announcement, although they

all agreed that nothing could be done

with it without money. Cottrell had no money. He was distinctly "hard up" in those days, but he was certain he could eliminate the assistance finally of Prof. Edmond O'Neill of the chemistry department This put him in a position where he taken seriously or were ridiculed.

"There's a smoke bug up in the university," was the only comment heard which even indicated to Dr. Cottrell ments of the future

It happened that the Riverdale



nundreds of thousands of dollars in plant and installed his process. It ine the smoke dust, which was coming Bureau of Mines here bears on this processing and winning their cases.

The company bought up the land at away with the smoke and collected ap-

\$1,000 an acre and then found it could proximately 100 tons of dust per day. | potash values contained in this dust. not stand the pace. More than \$1,000,- His presence at the plant gave him an The company took his advice and intrell to science was the electrical pre- Portland Cement Company, near Riv- 000 had already been spent by the comc'pitation of particles of liquids and erdale, Cal., was having all manner of pany in integration and still there was men running the business. They found Company is manufacturing chiefly potconstituents by a process of electricity. Undertaken first to eliminate the buds and killing the crops. The the "smoxe bug" at the university and barrels of cement a day and business and profitable means of getting potage.

"In the attempts of the United States to find some methods of increasing the potash production for fertilizers and other purposes to offset the stoppage of shipments from Germany there has come to the attention of the Bureau of Mines, Department of the Interior, a highly successful effort at the plant of the Riverdale Cement Company, River-

"This company, after a number of years of costly litigation with the

His Development of Helium and U.S. Supply of Potash Marks Striking Romance of Science

facent to the plant, because the mill discharged large quantities of dust that fell on the groves, installed a Cottrell electric precipitator with the sole hope of abating the nul-

"Word now reaches the Bureau of Mines that the factory of this cement company on March 1 went into full blast operation for the purpose of making potash, with cement as a by-product. The investigator who reported many details of this operation of the plant to the bureau

'This is certainly a romantic development of modern industry, where an apparatus installed for the purpose of saving the life of the factory turns out to be the centre of operations, around which the entire plant is adjusted, the incidental profits being sufficient, at least during the continuance of the war, to make the former operation of the factory of secondary impor-

But if one plant can make potash in this way, why not other plants? the Bureau of Mines asked. How about blast furnaces, the smelting plants, where the dust contains potash as it does in most cases?

Promises Plenty of Potash.

The United States Government now feels assured that by means of Dr. Cottrell's discovery America will have more than enough potash for its own needs without depending on Germany or any other outside source. In a statement issued on October 3 last Secretary of the Interior Lane said defi-

"The United States does not need German potash. America can in two years become entirely independent of Germany in this regard by the devel-Germany in this regard by the development of her own deposits and the ments in Washington. In this case opment of her own deposits and the War Department and the Navy use of processes devised by Dr. Cot- Department, as well as the Bureau of trell of this department."

Smelting and Refining Companies at Garfield, Utah; Maurer, N. J.; Omaha,
Neb.; the American Steel and Wire
Company at Worcester, Mass.; the Anaconda Copper Mining Company at production of helium seemed to Dr. Anaconda, Mont.; the Balbach Smelt-Cottrell sound. In a general way it ing and Refining Company at Newark. consisted of a process similar to liqueing Arms Company at New Haven, out before that was reached. To Dr. Conn., and others too numerous to Cottrell there seemed no difficulty in

The assets of the research corporation, of which men like Charles D.
Walcott, secretary of the Smithsonian
Institution, and Otto H. Kahn are directively done away with.

He set out to force action and tors, jumped to \$217862.72 from royalties | baunted the offices in question until he on Dr. Cottrell's invention as soon as became the "helium bug," which reit got fairly started. More money is minded him of his former "smoke bug" what to do with, but Dr. Cottrell is managed to cut enough red tape to get convinced that new scientific discover- things storted. les can be helped along by financial assistance from discoveries already made, the Bureau of Mines began to plead That is his slogan.

Development of Helium.

The idea of using helium in balloons, dirigibles, &c., is that it has practically the same lifting power as gen, but unlike hydrogen cannot be set aftre. It makes the balloon and dirigible safe against explosive bullets. It is the airship's defence against the incendiary bullet just as armor was the defence of the old wooden ships against cannon.

The military authorities dread to think what would have happened if the Germans had had hellum instead of hydrogen in their Zeppelins during the London and Paris raids.

It was during one of the Zeppelin raids over London that the first move toward developing helium started. An old British scientist fell to thinking what would happen if the Zeppelin could not be set afire. He remembered having put away an old report made some ten years ago by a Prof. Cady of the University of Kansas which elaimed that helium could be found in the ground in Oklahoma and Texas. He got the report out and sent it to the Admiralty.

The British experts decided that if there was one chance in a thousand to get anything of that sort it was worth taking, so they communicated with the Government of the United States and sent experts over. The experts were referred to the Bureau of Mines, and Director Manning of the bureau in turn referred them to Dr. Cottrell. Then things began to happen.

Dr. Cottrell Gets Busy.

Dr. Cottrell brushed aside all sceptical suggestions as to why the plan would not work. "We are not here to find out why it won't work, but to make it work," he said, and forthwith he started setting the wheels in

It is not easy to cut red tape and get action out of the executive depart-Among the plants already using the Cottrell processes are the American working and it was necessary to get money from Congress without telling

N. J.; the Minnesota Steel Company at faction of air, everything except Duluth, Minn.; the Raritan Copper helium was to be liquefied out, which Works at Perth Amboy, N. J.; the was possible because it required 268 Rome Brass and Copper Company at degrees centigrade below zero to was possible because it required 268 Rome, N. Y.; the Winchester Repeat- liquefy helium, and other gases went the practical application which could

oming in than the corporation knows title. But he kept after results and

As for getting money from Congress for an appropriation for important experiments in "argon," this being the camouflage name for helium. Congress Other important work has been done did not know what was going to be Dr. Cottrell, but the value of the done with argon, but Dr. Cottrell saw right man in the right place has been some of the Congressmen and the particularly emphasized by the devel- money was forthcoming. Now helium opment of the new non-inflammable is being produced in quantity at two big plants in Texas.

Songs Sung by New York City's Own in Camp and on the March

New York's Own-the songs When they see us first unlimb that sprang up of themselves, in camp, on the march, as genuine soldier songs generally do. THE SUN is indebted for the words to Capt. J. M. Loughborough.

SENDING THEM OVER. knocking them down, under the ground. Send every Hun, no matter how tall

they come, why, the harder You keep sending them over; we'll keep knocking them down!

VESLE AND ARGONNE (Tune: "Lord Geoffrey Amherst.") The Three-O-Four Artil-lerie that hails from old New York

Is a regiment that everybody knows—
for we started down in Upton in Sep-

tember, '17, And we lived through the Yaphank Yes, we lived through the Yaphank Then off across the ocean we were

shipped with all our men, They were soldiers loyal and true. came within our sight. And we looked around for more when

Chorus: They were names known to fame in days Now forever made glorious of yo-o-ore! By the fighting of the Three-O-Four.

Yes, too much if the truth be told; our screaming high explosives and our shrapnel's deadly rain— All the world knows they're laid out

And for our gallant regiment, among

the first to fight.

There's a big time coming some day—
When the ocean ferries get around to carrying us home And we sail past the Statue up the

(Chorus as before.)

MATERIEL (Tune: "When I Get You Alone To when we get our materiel.
Then the horses can go to hell.
When we slip into high how the
dust will fly!

Chug, chug, chug—watch us go by! When we slip them the first big shell How those Germans will run and yell-fries will wish they were in heaven When they hear our four-point-sevens. When we get our materiel!

Caterpillars will pull us through; There is nothing they cannot do— With a great many clanks we'll sho chug-just watch

the Seventy-seventh Division, As it's never before been done.
All the Boches will hit the timber With our brand new materiel

REGIMENTAL HISTORY. Oh, first we went to Baccart to learn to fight the Huns, And all we did was eat and sleep; we never worked the guns;
The Germans never fought by night,

they never fought by day A quiet place to learn to fight was up in Reherrey! CHORUS.

Home, boys, home, it's home we ought Then the Wope relieved us and we went

They all grow together up in North With all the big and little guns the Amerikee!

City of Verpel raised a lot of hell,

But when they got the Tankees goat, then they were S. O. I.

When we hike it always rains or snows.

across from old Bazoche
ree to Grandpre,

And took up a position for to harrass
And took in Abri Crochet and La VierHenry Boche.

Ing over France,

They tiled to catch the infantry, but prever had a chance;

What d'ye mean you stayed too long in prever had a chance;

What d'ye mean you stayed too long in prever had a chance;

What d'ye mean you stayed too long in prever had a chance;

What d'ye mean you stayed too long in prever had a chance;

to Vauxcere,
The doughboys tried to catch the Hun,
but he was on his way.
But when we settled in the town he
ranged us to a dot

the trail for Nice.

But first we spent a week in Paris
dodging the police,
Then Pershing planned another push
and called us to the line

the trail for Nice.

a lot of dope:
The eergeant tells the corporal when he
has cause to hope.
And still we practise fighting and liaison
in the mud.

What d'ye mean she wouldn't let you go?
Three months flat you get for that,
Just tuck that under your overseas hat!
What d'ye mean she wouldn't let you go?
Three months flat you get for that,
Just tuck that under your overseas hat!
What d'ye mean she wouldn't let you go?
Three months flat you get for that,
Just tuck that under your overseas hat!
What d'ye mean she wouldn't let you go?
Three months flat you get for that,
Just tuck that under your overseas hat!
What d'ye mean she wouldn't let you go?
Three months flat you get for that,
Just tuck that under your overseas hat!

Paris?

We started with the usual push, but Oh, now the war is over and we'll soon Home, boys, home, it's home we ought to be, to be safe at home, to the liked the night before. We're going to be hised to-night to the land of the foam.

For the ash and the oak and the sour We took up a position on a hill above. So we parked the First Battalion in the raised a lot of hell.

any I have seen.

Outfit from Camp Dix.

for them to quit

What d'ye mean you stayed too long in

Paris?

What d'ye mean you stayed too long in

Paris?

Because he knew without us he could never cross the Rhine.

In the mud,

Parie?

What do you mean that you missed your to be a dud.

When you know the thing is defendu?

"Major, it was but a field of weeds."
"Volla, Captain, you go where the Major What d'ye mean by walking on the win-ter wheat?

ter wheat? When I told you to guide me!

(Tune; "Drunk Last Night.") (This song originated among future of ficers at Platisburg.)

To help them break the line, And then keep things in order Along the River Rhine.

And the girls, the little dears,

They shout H! He for Battery They're the Red Leg Grenadiers;

(Tune: Of all tunes, Chopin's Fu neral March:)

We are the men of the Dead Horse Brigade. Glory halleluiah, giere halleluiah. We are the men of the Dead Horse etbook was empty it had a cavernous

For we have to dig another in the We are the men, &c.

That's the time that we all shine

ning short."

"Take your meal and go to helt!" No seconds-that's the mess kit rar!

The cows they go reaming all over

I want to go home.

77th's Brave Record Crowned by Victory in the Argonne With a dozen brother officers I had | you feel quite unnecessary. Or, "jolly | lift to Cassel in the camion of an Eng- | gion; for training was not to be live in the advance trenches. Accilbeen ordered to a Lewis gun school well uncomfortable." Personally, I lish machine gun captain. We had abandoned.

Continued from Fourth Page,

field rifle was particularly unfortunate, one man in my platoon of fifty-eight had ever handled a military rifle when But now the war is over, for the Dutch- we gave them the old Springfield-the beloved 1903 model. Only two others had ever fired any kind of rifle pre-Next they had been iss viously. the 1917 Springfield. And now it was a still stranger "piece," whose project-And the world's glad they're laid out ing magazine they balanced uneasily on their shoulders.

A good marksman should be as familiar with the "feel" of his rifle as a touch system stenographer with her ing a half holiday-Lieut, Charles keys. And quick expertness comes only after long usage. Yet about a British subaltern from an Irish regi-month later, after short, inadequate ment to take us, sub rosa, on a freerifle ranges had been improvised, fol- lancing trip to the front. lowing many importunate negotiations had become somewhat familiar with the weapon, the British rifles were away, and the original 1917 Springfields, battered and rusted from negligent storage, were returned. It

was disheartening, to put it mildly... Toward the end of April about half the personnel of officers and non-coms were shifted from their companies to nearby English schools of the Second British Army. The courses lasted two weeks, and our sergeants and corporals came back with a new

lore, each proud of his own specialty

in the process of efficiently eliminating

That the French peasant is amazas later events showed. At Upton just ingly adapted to living calmly under That the English officer is too darn reckless.

That Ireland wants, very much, her While there seems to be little connection between the four propositions one flows from the other as naturally

as a thin stream of red wine from a

goatskin canteen to a pollu's mouth.

It happened in this way: One Sunday afternoon-Sunday be-Greenwood and I induced a young

ambulances, steam tractors-anything that would stop at a British officer's flattened palm, which was everything the line at Mt. Kemmel a whizzbang dropped "out of the everywhere into the here"-to my thinking, altogether too much into the here. About thirty into the air and pebbles clink clinked

It was my first taste of shell fire. How does it feel? Well, dropping into such spirit? the vernacular and the ditch, it makes

manship, or something.

> up with laughter now. "Volla, les Americaines! Les officiers nouveaux!" he was shouting. "New officers!" I thought, "How does he find it so mighty amusing? That thing broke not so many miles away from himself."

Two hundred yards nearer the line English. we passed an old French peasant. beating out oats by hand at the edge roll, pondering the feasibility of putof a big field. That field was pitted ting the lid on war-permanently. with fresh craters and their number was being increased intermittently ment to take us, sub rosa, on a freelancing trip to the front.

For twenty miles we hopped forries,
ambulances, steam tractors—anything

Mith the middle of May came a

Shift for the division. This time it

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Shift for the division. This time it

Was a night's train ride from Flanlancing trip to the front.

Then we all fail into line

Then we all They were inured to this life that nature when orders came to move. A But there was novelty elsewhere, they were discarded. And we we might at any moment be death, these movement was always cloaked in the Many of the officers and men made to undertake French methods.

> ing: "It's war." French girl one day, guerre, M'sieu!" she replied. What enlogist is not fumb before

not to be dismissed with a long suffer-

French bicycle infantrymen into the

vective against England and all things

The Division Shifts.

ditch was only excuse for more speed.

that we went, as reserves.

Henry Bocke,
But Henry shelled us night and day and
gassed us in between—
As hot a spot was Farm des Dames as any I have seen.

Then we handed Heinle's number to an outfit from Camp Dix.

Bette on the way—

McDougal got a section up and got it dams well hit—

dams well hit—

And then the Boche decided it was time for them to quit

Paris?

What dye mean you took an extra day? Your little card told you what to do.

You know the one I mean, that little for them to quit

What dye mean you stayed too long in

What d'ye mean she wouldn't let you go?

oughness. And at the same time their courteous officers had a knack of with the "feed arm actuating stud," I as if some one had hung the ther-particular officer might easily have Artois—these are some of the familiar Knight was slightly wounded by a long the ther-particular officer might easily have Artois—these are some of the familiar Knight was slightly wounded by a long the ther-particular officer might easily have Artois—these are some of the familiar Knight was slightly wounded by a long the ther-particular officer might easily have Artois—these are some of the familiar Knight was slightly wounded by a long the ther-particular officer might easily have Artois—these are some of the familiar Knight was slightly wounded by a long the ther-particular officer might easily have Artois—these are some of the familiar Knight was slightly wounded by a long the ther-particular officer might easily have a long the there were the long the ther-particular officer might easily hav presenting instruction so attractively the following noteworthy that the keen receptiveness of the hings:

That one flushes, rather than The introduction of the British En
The introduction of th manship, or something.

About a hundred yards down the cept Where Otherwise Stated" list. Swerving out of the radiator of a five heard, for ammunition dumped in that During the nessed the incident. He was doubled ton truck playfully to bump two vicinity.

Where Bombs Fell Thick.

Doullens, too, as a bomb waste opening. Light wine prices fermented I enjoyed that ride less than I did basket, was not altogether unpopular overnight from three france, or about Before we stole into quarters after with the enemy avions. At first a sixty cents a bottle, to six and seven midnight my young Irish friend in night raid was a spectacle not to be British uniform launched into an inhad forgotten one of our last hights in Zutkerque, when the only drill field And thus I slipped into my bedding available had been turned into a put- ble in a typical French village. ting green for medicine balls. Eleven if the French prices were somewhat huge craters disfigured a landscape where before platoons had executed pelled to pay dearly during the long perfect "on rights" and "lefts into

harvesting: I began to understand the of Pas de Calais and into the Somme, novelty and became irksome sleep dis-laughter of the French enfant terrible. Rumors had been of an interesting turbers.

French. No calamity was too great profoundest mystery as to destination. friends among the R. F. C. fliers at an We were heading for the Somme, aerodrome near by and that meant first days train trip in between was to That our compasses told us. And the ascents. Baseball and boxing with the make veteran billeters out of the men. An officer of the 302d Engineers Somme at that time was a word with Canadians were regular part of the and, at the same time, teach them that mockingly chided a 10-year-old which to conjure. A Boche drive was holidays. One night we spent in re- every soldier has feet-good, dependa-"Your mouth expected at Arras. And it was to an serve trenches on a practice relief. ble feet, if he be wiss. s dirty, ma p'tite!" he said. "C'est area about twelve miles behind Arras And twice a week, for three day we went, as reserves.

Deriods, one officer and two or three Mountains and our own little slice of And the only bright spot is Louise—

We detrained at Mondicourt, the sergeants from each battalion would front. And almost at once came the Pin tee young to drown in this hell nuch spirit?

Returning that evening we got a five or six miles to our training re- Tours to the Front." There they would the same trench.

He was killed by a long dis-During these days the men learned that whether or not the French pock-

"Hoofs"-eggs-were about 19 cents The boys paid with good grace. After all, there were few things purchasaexcessive, these people had been comyears of war.

ties were discarded. And we were soon

Beyond lay Lorraine, the Vosges

e to God at last we're in the fight, Glery WE'RE A TOUGH YOUNG BUNCH,

Just gaze on us, we're a tough young We're artillery from New York,

You can tell we're army broken, For we eat the army pork, We sailed across the ocean

Our machine guns never jam And we do not give a damn We fight like the devil on the rough or on the level. And we fight for Uncle Sam,

Are in love up to their ears; They shout Hi He for Battery B And the good old Three-O-Four! Our 75s they roar as we go to well

THE DEAD HORSE BRIGADS

THE MESS KIT RAG. Come and get it.

I WANT TO GO HOME. want to go home, I want to go home: The children and chickens get under